## PANEL 1

**Education & Workforce Development**
This panel will provide information on public private partnerships in education and efforts to prepare students for jobs within the life sciences industry.

Panelists
Dr. Susan Baxter, Executive Director, California State University Program for Education and Research in Biotechnology (CSUPERB)

Dr. Mary Pat Huxley, Statewide Director Biotechnology, California Community Colleges

Dr. Ron Quinta, Dean of Science, Technology and Academic Affairs, Ohlone College

Patricia Kitchen, Instructor, Mission Valley Regional Occupational Program

## Biographies

### Panel 1

**Susan Baxter, Ph.D.**
Dr. Susan Baxter is the Executive Director of the California State University Program for Education and Research in Biotechnology (CSUPERB). Created in 1987 CSUPERB provides vision, leadership and support for biotechnology education and research throughout the CSU to promote biotechnology and economic development in California. Today CSUPERB supports innovative coursework, real-world research experiences, and core resources for students and faculty across all 23 CSU campuses.

Prior to assuming this position in March 2007, Dr. Baxter served as Chief Operating Officer and board member at the National Center for Genome Resources in Santa Fe, New Mexico. She was also Vice President of research and genome analysis at GeneFormatics, later Cengent Therapeutics, a drug discovery company in San Diego, where she managed programs in both target and lead discovery. Previously, Dr. Baxter was a tenured researcher at the New York State Department of Health's Wadsworth Center, where she used nuclear magnetic resonance spectroscopy to characterize DNA-binding proteins and their complexes. Dr. Baxter began her career as a research scientist for Monsanto Agricultural Company, where she received a Monsanto Company Achievement Award for product development. She received her undergraduate degree in chemistry from the University of Virginia and her master's of science and doctorate degrees from Northwestern University in Evanston, Illinois.

**Mary Pat Huxley M.Sc., Ed.D.**
Dr. Mary Pat Huxley enjoys being involved in the thriving biotechnology industry of California, and draws upon these areas of expertise and experience in helping prepare the workforce for this thriving industry sector. She has spent fourteen years as an adjunct instructor in biology at Ventura College, more than a decade as a biological environmental scientist and consultant, three years as a regional director in the Applied Biotechnology Centers Initiative and even years as the State Director of the Applied Biotechnology Centers Initiative for the California Community Colleges.

She earned a bachelor's degree in biology from University of California San Diego, a master of science in genetics from the University of Dublin, Trinity College and a doctorate in Organization Change from Pepperdine University

**Dr. Ron Quinta**

Dr. Ron Quinta, the Dean of Science, Technology and Academic Affairs at Ohlone College, Fremont, CA. His undergraduate and master's degrees are in Bioscience, and his doctorate is in Education—Curriculum & Instruction. Academic Dean for Ohlone College for over 10 years. Committee memberships include: Bio Safety Review Board (CSU East Bay); Advisory Committees for Career and Technical Education Programs in the Bay Area; and Biotech Workforce Network. He is closely aligned with workforce development agencies and biotech industry associations, the *NSF, NASA Ames Research Center, California Applied Biotechnology Center (Bay Area), Bio-Link, and other academic institutions* interested in furthering the success of science and technology initiatives. Serves as principal investigator for the NSF ATE Learning Alliance for Bioscience Project. Oversees the CCCCO EWD grants—Industry Driven Regional Collaborative; Job Development Incentive Fund; and SB 70 grants including Quick Start, Strengthening CTE, and Career Exploration for 7$^{th}$ and 8$^{th}$ Graders.

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# Partnerships in Education and Workforce Development

Susan Baxter, Executive Director
California State University Program for Education and Research in Biotechnology (CSUPERB)

**Assembly and Senate Select Committees on Biotechnology**
**Ohlone College, Fremont, California**
**October 29, 2007**

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- **CSUPERB**: program introduction and impact
- Capacity and reach of **CSU biotechnology** curriculum growing
- Two examples of innovative curriculum aiming to prepare students for jobs within the life sciences industry:
  - Alfred P. Sloan Foundation funded system-wide **Professional Science Masters (PSM) Initiative**
  - San Diego Partnership for **regional workforce development**

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## Since 1987, CSUPERB has focused on the integration of biotechnology teaching and research in the CSU

**CSUPERB** provides vision, leadership and support for biotechnology education and research throughout the CSU to promote biotechnology and economic development in California.

Activities include:

- **Competitive Grants Programs**
- **Undergraduate Research and Awards Programs**
- **Annual CSU Biotechnology Symposium**
- **Liaison for government and biotechnology industry partners with CSU**

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## Between Fall 2003 and Fall 2005, CSUPERB awarded $1,291,836 in grants to 90 investigators on 18 CSU campuses*

**IMPACT:**

- 530 CSU students were involved in cutting edge research projects preparing them for discovery research positions in graduate school or industry
- Nine new courses on seven different CSU campuses and four new degree programs initiated
- CSUPERB investigators received follow-on funding from federal agencies totaling $9,397,600 - ***better than a 7:1 return on investment***

This year the CSU is asking for **$3M in Applied Research budget change proposal** to address emerging grand challenges in biotechnology, such as agricultural biotechnology, biofuels engineering and biomaterials

*_http://www.csuchico.edu/csuperb/GrantAbstRnd1-16_Chron.htm_

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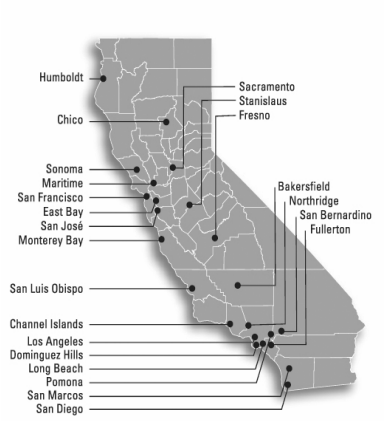
## Theory + Practice: CSU provides fundamental and industry-responsive biotechnology education statewide

- CSU graduates more than ***80,000*** students per year
- 44% of life sciences and health professions bachelors' degrees in California; 65% of business graduates; 50% of engineering and agricultural engineering bachelors' degrees; 41% of the state's health care and life sciences graduate degree holders.
- The CSU graduates more African American, Hispanic, and American Indian students than ***all other*** California universities combined

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## CSU strategies for life sciences workforce development aim to prepare students ready to "hit the ground running"

- CSU focuses on "**theory plus practice**" approach
- **Regional approach**: High demand exists in *pharmaceutical product development* and *biomedical devices and diagnostics* sectors in the San Francisco Bay Area, Greater Los Angeles region, and San Diego County
- **Industry-responsive:** Rigorous science augmented by *regulatory affairs, clinical trails management, and biomedical quality systems* training is required to meet demand in these sectors

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## Example 1: Professional Science Masters (PSM) Industry responsive degree programs

- In March 2007 CSU initiated the largest PSM program in the nation with support of $891,000 from the Alfred P. Sloan Foundation
- The CSU is establishing and further developing 16 professionally oriented PSM programs on 12 CSU campuses
- PSM programs are characterized by industry partnerships, industrial internships, real-world case study focus, and multidisciplinary team projects

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## Twelve CSU PSM Programs are in biotechnology fields:

- Bioinformatics (SDSU)
- Biostatistics (CSU-East Bay)
- Biotechnology (CSU-Fresno, SFSU, SJSU, CSU-Channel Islands, CSU-Fullerton, CSU-LA, Cal Poly Pomona, CSU-Dominguez Hills, CSU-San Marcos)
- Clinical trials management (SJSU)
- Environmental Sciences (CSU-Chico, CSU-San Bernardino)
- Genetic Counseling (CSU-Stanislaus)

*http://www.calstate.edu/psm/Program-Directors.shtml*

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## PSM programs address competitiveness crisis by providing innovative educational solutions to workforce needs

- Programs responsive to life sciences industry workforce needs, especially in product, process and regulatory development
- Appropriation in S. 761, *America COMPETES Act*
  - NSF national PSM program will significantly facilitate growth
  - Continuation of PSM national commitment
    - National Governors' Association
    - National Conference of State Legislatures
    - Council of Graduate Schools

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## Example 2: Beyond the Degree Life Sciences Industry Certificate (Summer 2008)

*The San Diego Biotechnology Education Consortium (www.sdbiotechcareers.org):*

BIOCOM; CONNECT; the San Diego Workforce Partnership; CSUPERB; San Diego State University; California State University, San Marcos; University of California, San Diego Extension; and the Southern California Biotechnology Center, San Diego Miramar College

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## Addressing difficult transition to first life sciences industry job and industry's need for business savvy scientists

- Targeting **skilled scientists** from academic degree programs or research institute positions
- Expert faculty will present principles and practice associated with life sciences **product, process and regulatory development**
- Certificate holders will have **practical understanding** of life sciences functional business areas, familiarity with the regional San Diego business environment, and industry networking and internship experience

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## Summary

• CSUPERB funds innovative programs for undergraduate and graduate biotechnology education; the CSU Applied Research budget change proposal aims to enhance biotechnology education and research across the CSU

• CSU is invested and active in offering innovative, industry-responsive biotechnology curriculum for California

• CSU is committed to partnering with other higher educational systems and the biotechnology industry to develop California's diverse workforce at all degree levels

ECONOMIC & WORKFORCE DEVELOPMENT through the CALIFORNIA COMMUNITY COLLEGES

# Life Sciences Workforce Development in the California Community Colleges

Dr. Mary Pat Huxley

Prepared for the Assembly and Senate Select Committee on Biotechnology

29 October 2007

ECONOMIC & WORKFORCE DEVELOPMENT through the CALIFORNIA COMMUNITY COLLEGES

## It's about jobs for Californians

## It's about the current CCC biotech network

State Director

Six Regional Centers

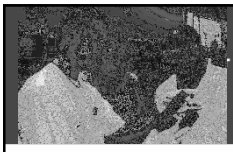
- North Valley
- Bay Area
- San Joaquin
- Coast
- LA Basin
- San Diego

Two Strategic Hubs

- Sacramento
- Ventura

## It's about the college life science courses/programs

- All 109 CCCs offer life science skills and knowledge courses.
- About 104 Specialty Programs and Courses in life sciences are offered by 39 CCCs, formed with industry member input and with a faculty member or CalABC director from industry or an internship in industry. Please refer to handout for a list.



# It's about working together

- Small businesses – 80% or more of biotech companies employ 50 or less
- Large companies – Amgen, Genentech, Invitrogen, Biogen-Idec, others
- Regional Industry Organizations – BayBio, BIOCOM, SoCal Biomed Council
- Workforce Investment Boards, Labor Department and Agency
- Universities – CalState, UC and Private
- Government – local, regional, state, federal

ECONOMIC & WORKFORCE DEVELOPMENT through the CALIFORNIA COMMUNITY COLLEGES

# It's about continually meeting workforce needs

**Emerging Workforce: Education**

**Transitional Workforce: Displaced, Re-careering, Re-skilling**

**Incumbent Workforce: Upskilling**

**Entrepreneurial Small Business**

Long Term

Intermediate

Short Term

# Public Private Partnerships in the California Community Colleges and Efforts to Prepare Californians for Jobs in the Life Sciences Industry

Prepared for the California Assembly and Senate Select Committee on Biotechnology Hearing On Monday, October 29, 2007

Prepared by Dr. Mary Pat Huxley, Statewide Director of the California Applied Biotechnology Centers Initiative of the California Community College Economic and Workforce Development Program

Contact information: mphuxley@vcccd.edu 805 648 8977. See also www.cccbiotech.org.

## Introduction

**Our Applied Biotechnology Centers Initiative exists to provide life science industry relevant job skills and knowledge to Californians at the technician level. Our mission is about actions to carry out our mission efficiently and effectively. We know it's about jobs for Californians.**

As one of ten initiatives of the Economic and Workforce Development Program, we are the California Applied Biotechnology Centers (CalABC). The California Community Colleges, by State Law through Education Code 88532, have had a network in place for workforce training and education in life sciences since 1996. We in the CalABC implement the law through six regional centers, two statewide hubs and one state director.

All 109 California Community Colleges have two-year associate science degrees that can lead to jobs in the life sciences industry. About 39 of the colleges have current and active hands-on skills courses offered for biotechnology. A current listing follows this brief statement.

1. It's About Jobs for Californians

   California is one of the most diverse regions on the planet in almost any term you care to name. To serve our citizens, faculty members in the 39 colleges with life science job preparation curricula join with the regional center directors to partner with industry representatives. This partnership exists to create job-relevant knowledge and skills to prepare Californians for specific types of life science employment.

   Please keep in mind that all 109 California Community Colleges offer courses in chemistry, physics and life sciences and math. The 39 colleges mentioned here created tailored and/or specific courses for biotechnology and the life sciences.

2. It's About Current CCC Biotech Network

The current CalABC Network consists of six regional centers, two hubs and one state director. Each regional director is responsible to support life science curriculum development with colleges in their regions, partner with each other and with local and regional partners. We ensure that partners in industry know that Californians enrolled in these courses receive the skills and knowledge necessary for life science jobs.

For example, the Southern California Biotechnology Center conducted a formal DACUM to establish research associate skill sets. DACUM, an acronym for a formal process of **D**esigning a **Cu**rricul**um**, is a thorough but gut wrenching, two-day analysis of a job, but it is done *by* workers of their own jobs. The DACUM can be used by faculty to design certificate programs. Certificate programs teach the industry defined theory and 'hands-on' techniques. The regional community college programs shown in **List 1** below are often expensive to run and sometimes suffer from low enrollment.

3. It's About College Life Science Programs and Courses

Courses in the applied life sciences are created with industry members input. Not only does this input shape course content but also the place, time, duration and location of course delivery. All 109 Colleges offer complete science and math courses. As of this month, at least 39 CCCs offer at least 104 specialty courses that are designed for jobs in the life sciences industry. Please see the listing of these courses in **List 1** below.

For example, workshops for currently employed industry workers in "Excel in the Lab," which teaches how mine company data through Microsoft Excel, are held on Saturdays at an off-site campus of American River College and conducted by the North Valley and Mountain Biotech Center at a cost of $40 per course. The location is easy to reach and the computer lab there allows the instructor and the employees to each work on the same data at the same time on the computers.

Enrollees in the Pasadena City College Stem Cell Course use adult mouse stem cells donated by Cal Tech to learn the special skills needed to culture these cells. Students have already been hired by Howard Hughes Memorial Institute, UC Los Angeles and Cal Tech stem cell labs.

The CalABC – San Joaquin provides classroom laboratory kits for community college biology programs. We purchased the following kits: DNA fingerprinting and bacterial transformation from Bio-Rad, and DNA Amplification and ELIZA from Edvotek. We shipped forty-four kits to four instructors at Fresno College and two instructors at San Joaquin Delta College. Instructors from four high schools in the region also participated in the program.

4. It's About Working Together

These courses and programs never stand alone, isolated from the employment world. We rely upon our partners in industry, economic development, the Workforce Investment

Boards, local and regional industry organizations, and others too numerous to name to guide our workshop, on-site, classroom and laboratory instruction. Employers rely upon us to provide job-ready skilled workers. Please see the **List 2** below to see many of our current partners.

About 80% of life science and biotech companies in California have 50 employees or less. Regional CalABC directors find these companies, work with them and connect them with local colleges that can provide their trained work needs.

Incubating start-up companies occurs in partnership with the Los Angeles/Orange County CalABC director and the Pasadena Bioscience Collaborative. The Director provides wetlab oversight and is an Advisory Board member for the incubator. The incubator is housed in the Pasadena Bioscience Collaborative (PBC) in partnership with Oak Crest Institute. The incubator grew from 500 to 3000 sq ft and houses eight early stage biotech companies, all meeting their funding milestones. Two companies have received patents, three companies have received additional Small Business Innovative Research grants, and three have received investor funding. Two companies are now alumni, receiving the PBC Golden Feather certificate for "graduating" out of the incubator. Three cities with associated community colleges have asked for assistance to replicate biotech business incubators in their cities.

Large companies need entry-level technical workers as well. Regional faculty and center directors work with larger companies as well. Sometimes, the human resources department of a company will say that they do not hire from community colleges, but we know that they do. Amgen, Genentech and Biogen-IDEC recruit from Solano College, City College San Francisco, Ohlone College, Skyline College, Merced College, Ventura College, Moorpark College, Los Angeles Pierce College, Pasadena College, Miracosta College and Miramar College.

Faculty members and regional directors also know that graduates of these programs become employees in a "hidden" employer group. Namely, these are the research laboratories in four-year universities. They are in need of skilled laboratory technicians, from animal handlers to media preparers to stem cell culture technicians. Californians who have received CCC training are employed at Stanford, UC Berkeley, Cal Tech, UC Los Angeles, Cal Poly Pomona and UC Santa Barbara, to name a few.

An example: through effective partnerships, MiraCosta College has become one of the few community colleges to offer a comprehensive biomanufacturing program. Biogen-Idec contributed $200,000 to pay for half of an instructor's salary for four years. With input from the company and the International Society for Pharmaceutical Engineers, the college's machine shop was converted into a biomanufacturing teaching facility at a cost of about $1.2 million. The college now has 'institutionalized' the faculty position and is maintaining the facility. Biogen-Idec sold their facility to Genentech but the people remained the same and the close ties with the program remain.

A fascinating example of moving needed equipment to training sites comes from the Central Coast Regional Director. Amgen, Inc asked for assistance with the distribution of a huge volume of research equipment. This meant relocating the contents of an entire research building to colleges in the Central Coast and San Joaquin Valley regions. Although this donation required twelve semi-tractor truckloads of equipment, it was all moved at no cost through a partnership structured with the Fresno Center for Applied Competitive Technology, another CCC Economic and Workforce Development Center. Amgen removed and loaded the items onto the trucks of a Fresno business (Rees Foods) that had delivered produce to the LA Harbor. The trucks were empty and would have been "dead-heading" home. They filled their trucks for the trip north from Thousand Oaks back up the valley and did this for free. The Fresno County Corrections Department provided free labor for unloading, and the City of Dinuba warehoused the items. These items were then redistributed to the regional colleges and high schools.

5. <u>It's About Continually Meeting Biotech Workforce Needs</u>

As workforce intermediaries, we work to keep pace with the workforce skills and knowledge changes in the life science industry. Our industry and industry association partners inform us of these changes, helping keep the instruction current. We are cognizant that we also keep the essential, core knowledge that must accompany the skills.

In an example of current industry use coming to the classroom, the bacterial contamination in spinach that was a scare in late 2006 was detected with an instrument called the SmartCycler from Cepheid, Inc. This instrument is in current use for training high school and community college instructors in its use for an SB-70 funded project to map water contamination. Water samples are collected from streams and rivers, GPS units are used to map the sample location, and the sample is prepared and run through the SmartCycler for a count and identification of the bacteria. The Central Coast Biotechnology Center Director also uses this SmartCycler in workshops designed to demonstrate the latest technology to industry representatives from Integrity Biosolutions, Amgen, Seminis Vegetable Seeds, Invitrogen and Baxter.

Another example is the computer short-courses for incumbent workers from CalABC - North Valley. After the initial success of the first Excel in the Lab course, we developed two additional courses, Advanced Excel in the Lab and Access in the Lab. The classes are one-day short-courses focusing on those skill sets most needed in life science laboratories. The Advanced Excel in the Laboratory had 23 participants from four local biotechnology companies. We offered two sections of Access in the Lab. One was designed for a more general audience with 49 participants from five local biotech companies. The other was custom tailored to one of the life-science companies in the region, Arcadia Biosciences with 25 employees attending, which was about half of all their employees! After the training the IT staff at the company followed up by provided tips and supplementary assistance to their employees who had taken the course. Participants wrote: "Very useful training – quite detailed – prepared well." "As a first Access course I think the workshop is great. I got a great knowledge on Access." "Good foundation – as a user of Access I'm ready for the advanced class."

## Conclusion

This brief summary barely mentions the myriad activities of each center, and only summarily lists the extensive offerings of biotechnology programs/courses/certificates at each college.

> ***For more information*** please refer to the documents "California's Biotechnology Workforce Training Needs for the 21st Century" by Dr. Gus Koehler, 2006 and the White Paper "The History, Current Status, and Future Direction for the California Community Colleges Biotechnology Initiative: Helping Meet the California Biotech Industry Need for an Operational Workforce," by Dr. Mary Pat Huxley, 2004. Both are available in PDF files at www.cccbiotech.org.

# List 1 - Curriculum in the California Community College System to Prepare Californians for Jobs in the Life Sciences Industry

List compiled by Dr. Mary Pat Huxley, October 2007. Please also see www.cccbiotech.org. Not every course related to biotechnology is listed. For instance, enology (wine-making) courses are not included, which is a most ancient of biotechnology arts. Some colleges include biotechnology topics in Microbiology Courses and bioinformatics may be included in Information Technology courses.

The total number of College offering the 104 courses in this list is 39, or 36% out of the 109 California Community Colleges. All 109 Colleges offer the fundamental and necessary courses in biology, chemistry, microbiology and math required for employment in the life sciences industry.

| Program Offered | California Community Colleges |
|---|---|
| Applied Biotechnology, including "Methods in Biotechnology" | American River College<br>Berkeley City College (was Vista College)<br>Ohlone College<br>San Diego Miramar College |
| Animal Health Technology | San Diego Mesa College |
| Bioinformatics, including "Introduction to" and "Briefings In" and BioPERL Programming or XML or Computing Concepts in | American River College<br>City College San Francisco<br>Foothill College<br>Fullerton College<br>Los Angeles Valley College<br>Ohlone College<br>Pasadena City College |
| Biotechnology<br>or Introduction to Biotechnology<br>or Basic Biotechnology<br>or Careers in Biotechnology<br>or Principles of<br>or Fundamentals of<br>or Foundations of<br>or Advanced Topics | American River College<br>Bakersfield College (not currently offering)<br>Berkeley City College (was Vista College)<br>College of the Canyons<br>Chabot College<br>City College San Francisco<br>Cuyamaca College<br>Foothill College<br>Fresno City College<br>Fullerton College<br>Gavilan College<br>Lake Tahoe Community College<br>Laney College<br>Las Positas College<br>Los Angeles Pierce College (summer only)<br>Merced College<br>Moorpark College<br>Ohlone College |

| Program Offered | California Community Colleges |
|---|---|
| | Pasadena City College<br>San Diego Miramar College<br>Solano College<br>Southwestern College<br>Skyline College<br>Ventura College<br>Victor Valley College |
| Biotechnology, Cases in Industry Practice | Contra Costa College |
| Biotechnology and Society | American River College<br>Foothill College<br>Ohlone College |
| Biotechnology Instrumentation | Berkeley City College<br>Contra Costa College<br>Foothill College<br>Glendale College<br>Los Angeles Valley College<br>Solano College |
| Biotechnology Lab Assistant | MiraCosta College |
| Biotechnology Research and Development Technician | MiraCosta College |
| Biotechnology Manufacturing Operator<br>or Principles of Biomanufacturing<br>or Introduction to<br>or Fermentation Technology | Foothill College<br>Laney College<br>MiraCosta College<br>Moorpark College<br>Ohlone College<br>Skyline College |
| Biotechnology Work Experience, includes internships | American River College<br>City College San Francisco<br>Pasadena City College<br>Solano College |
| Bovine Embryo Transfer | Lassen Community College |
| Cell Culture, Mammalian and/or Stem and/or Animal and/or Bacterial and/or Cell Culture and Protein Recovery | City College San Francisco<br>Contra Costa College<br>Moorpark College<br>Ohlone College<br>Pasadena City College<br>Solano College |
| Chemistry for Biotechnology | Chabot College |
| Chemistry Technician | Los Angeles Trade Technical College<br>San Diego Mesa College<br>Southwestern College |

| Program Offered | California Community Colleges |
|---|---|
| DNA Sequencing & Bioinformatics: Basic Lab Techniques | Foothill College |
| Electron Microscopy | East Los Angeles College<br>San Joaquin Delta College |
| ELISA Assay | City College San Francisco<br>Contra Costa College |
| Equine Reproduction | Cosumnes River College |
| Forensic Technology | Grossmont College<br>Lake Tahoe Community College |
| Genomics, including “Introduction to” | American River College |
| GMP and/or GLP<br>Business and Regulatory Practices | City College San Francisco<br>Contra Costa College<br>Foothill College<br>Solano College |
| Histotechnology | Mount San Antonio College |
| Laboratory Technician | College of the Sequoias |
| Math Applications in Biotechnology | City College San Francisco<br>Ohlone College<br>Skyline College |
| Media Preparation in Biotechnology | Contra Costa College |
| Nanobiotechnology Sciences<br>Introduction to Nanotechnology | Foothill College<br>Ohlone College |
| Organic Chemistry | Grossmont College |
| Plant Biotechnology or Horticultural Practices | Foothill College<br>Fresno City College<br>Ohlone College<br>Ventura College |
| Polymerase Chain Reaction Application and Theory | City College San Francisco<br>Contra Costa College |
| Principles of Cellular and Molecular Biology | Grossmont College<br>Solano College |
| Western Blotting | City College San Francisco |
| Veterinarian Technician | College of the Sequoias<br>Los Angeles Pierce College<br>Mount San Antonio College |

# List 2 – CalABC Existing Partnerships with the Life Sciences Industry Listed by CalABC Regions

By no means is this an exhaustive list.

**San Diego Region – Dr. Sandra Slivka, Regional Director**
Industry organization – BIOCOM

Colleges – Miramar College, MiraCosta College, San Diego Mesa College, San Diego City College, Southwestern College, Cuyamaca College, Grossmont College, Victorville Valley College. Created a regional advisory board for all regional colleges

High schools – too many to list, but specifically the Center provides a special day for High School Counselors where they learn about biotech jobs to share with students

Industry – Arena Biosciences Inc., Favrille, Inc, Genentech Inc,, Biogen-IDEC, Amgen Inc., Alexion Antibody Technologies, Inc., Allel Biotechnology & Pharmaceuticals, Anadys Pharmacueticals, Animal Hospital at the Narrows, Diversa, Gen-Probe, to name several of the many.

Economic Development – San Diego Workforce Partnership, regional EDC agencies

Internships - Maintain Website for student 'one-stop shopping' www.sdbiotechcareers.org

**Los Angeles – Orange County Region – Dr. Wendie Johnston, Regional Director**
Internships - Placed 23 interns who increased the performance metrics of the companies where they worked and 55 interns from 9 regional colleges who performed on grant-based internships.

Regional Colleges – Los Angeles Pierce College, LA Trade Technical College, College of the Canyons, Orange Coast College, Coastline College, LA Harbor College, LA Mission College, LA Valley College

Economic Development – Entretech in Pasadena, Economic Development Agencies in LA and Orange Counties, Strategic Advisory Board of Entretech, the Executive Board for LA Tech Week and the Advisory Board for the Pasadena Bioscience Collaborative.

Industry Organizations - Southern California Biomedical Council, OCTANE

Universities – California Polytechnic University at Pomona, UC Los Angeles, California Institute of Technology (Cal Tech)

High Schools – many regional high schools too numerous to list

**Central Coast Region – Dr. James Harber, Regional Director**

Universities – UC Santa Barbara, CSU Channel Islands, Cal Poly San Luis Obispo

Regional Community College biotechnology programs at College of the Canyons, Moorpark College and Ventura College

High Schools – Ojai High School, Oxnard High School, Thousand Oaks High School, Ventura High School, Moorpark High School, and Foothill Technical High School

Economic Development - EVC-San Luis Obispo, Ventura County Economic Development Association, Tech Coast Angels, Gold Coast Venture Forum, Business and Technology Partnership, Cal Lutheran University Corporate Leaders, California Healthcare Institute and the National Park Service

Companies - Amgen, Inc., Baxter, Intl., Seminis Vegetable Seeds, Ceres, Inc. (plant biotech), Integrity Biosolutions, Dako Cytomation, Intl., Invitrogen/Biosource, Inventios, Dermaport, Alfred Mann Institute, Biodiesel Industries, Onsite Power, Dermaport and Girvan Technologies.

Labor – Ventura County Workforce Investment Board

**San Joaquin Region – Susan Murphy Patereau, Regional Director**

Universities – UC Merced, Lawrence Berkeley National Laboratory run by UC Berkeley, UC Davis, Lawrence Livermore National Laboratory Edward Teller Education Center

Regional Colleges – Gavilan College, Merced College, Reedly College, Fresno City College, Modesto College, San Joaquin Delta College

Economic Development – California Partnership for the San Joaquin Valley, Workforce Investment Boards and EDCs in Silicon Valley, Morgan Hill, Gilroy, Hollister, and Modesto. The Stanislaus Alliance

High Schools – James Enochs High School in Modesto, Tracy High School, Sobrato High School, Gavilan High School, Andrew Hill High School and Regional Occupational Programs

Industry - Roche Molecular Systems

**Bay Area Region – Dr. Nora Lem, Regional Director**

Industry Organizations – Bay Bio and Bay Bio Institute. The Director's Office is housed in the building of Bay Bio Institute.

Regional Colleges – City College San Francisco, College of Marin, Ohlone College, Solano College, Foothill College,

Other – Bay Area Community College Consortium, the Bay Area Biotechnology Education Consortium for high schools – a close collaboration

Industry – Genentech, Bayer Corp, Cell Genesys, Inc., DOE Joint Genome Institute, Intel Corporation, Novartis Vacines and Diagnostics Inc, Perlegen Sciences Inc, Thermofisher (Nunc/Nalgene), WaferGen Inc, XactaGen, Abbott Laboratories.

**North Valley Region – Jeffery O'Neal, Regional Director**

Regional Colleges – Woodland Community College, Sacramento City College, American River College

Internships – A total of 16 internships for students were created

Universities – UC Davis, CSU Sacramento, UC Davis Genome Center, and the UC-Davis operated Edward Teller Education Center at Lawrence Livermore National Laboratory

Start-up businesses - Technical assistance to two new start-up ventures in the region, Tellomolecular in Rancho Cordova, and Vitalea Science in Davis primarily in the area of defining employee skill sets and identifying sources of qualified personnel.

Industry – Novozymes, Arcadia Biosciences,

Economic Development – Sacramento Area Consortium T O,

High Schools - Santa Clara County Biotechnology Educational Partnership

A World of Cultures United in Learning

OHLONE Biotechnology

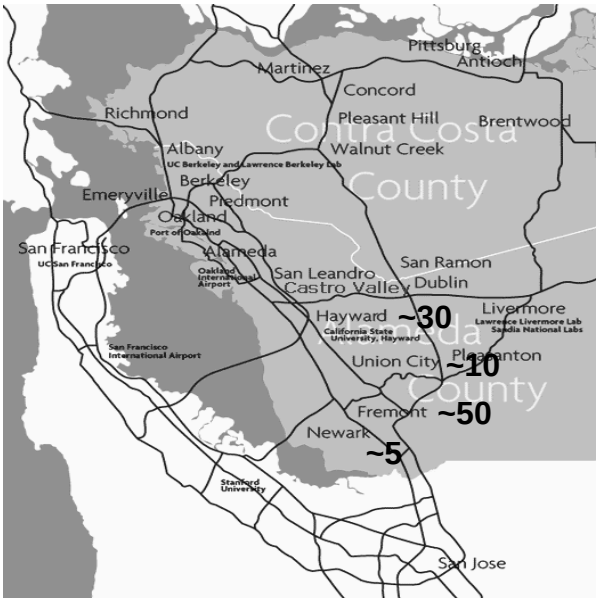
**Assembly and Senate Select Committees on Biotechnology**

**Fremont, Monday, October 29, 2007**

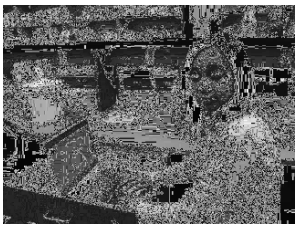
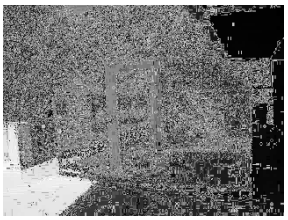
**Dr. Ron Quinta, Dean**
**Science, Technology & Academic Affairs**

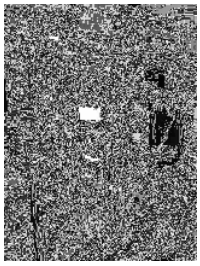
## Biotech Companies in Southern Alameda County

**Fremont, Newark, Union City & Hayward (approx. numbers)**



## Present Biotech Training Facility: Fremont Campus

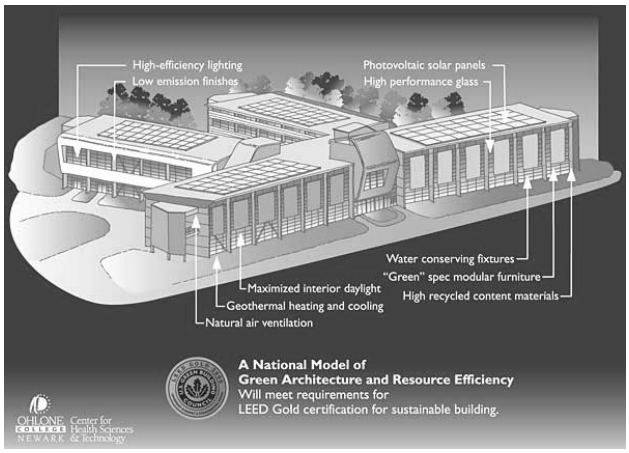


## New Site for Biotech Training Laboratories

*Newark Center for Health Sciences & Technology*

with 3 biotech laboratories (including cell culture lab complex)

Opening January 27, 2008

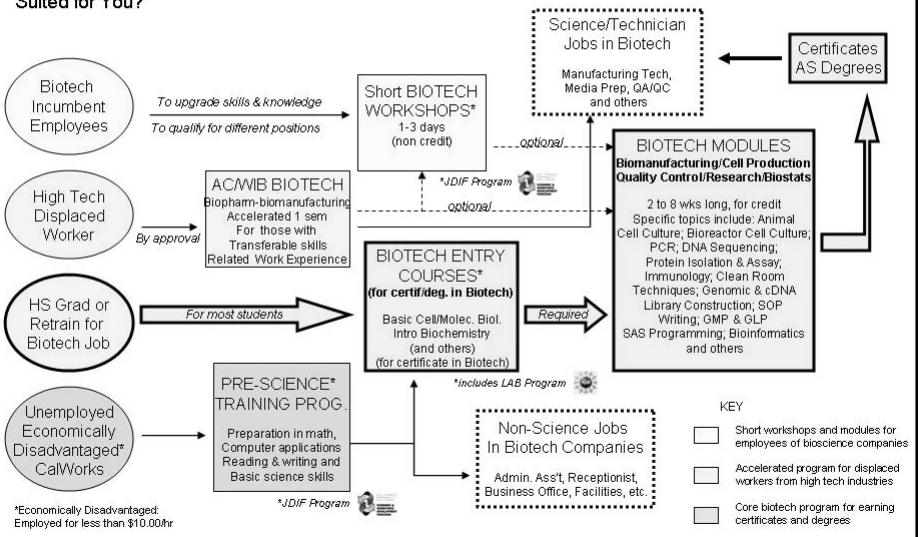


## Biotechnology Training Programs

OHLONE COLLEGE Biotechnology

**Which Program is Suited for You?**

**Program Options Offered by Ohlone College**




*Economically Disadvantaged: Employed for less than $10.00/hr

**Partnerships are vital for the Success of our programs**

## Ohlone College Biotech Programs:

### Incumbent Industry Employees Training

Short Workshops

**Partnerships & Funding Sources**

- Regional Biotech Industry— Amgen, Genentech, Bayer, Allergan, Cell Genesys, Agilent, Johnson & Johnson, Boston Scientific, Supergen, Metabolex, Biokey, Aryx, Applied Biosystems, Quidel, Abbott, Solstice Neurosciences, Novaros, Novartis, Aleeva, XDX, BD Bioscience, Intermune, Geron, Medimune, Codexis, Impax, Hardy Diagnostics, Stratagent, Sunisis, PDL, Altera, Maxygen, Bioquest, Nanomix, Bio-Rad, Macusight, Planet Biotech, Mendel Biotech, BioCenter (San Jose), and others companies, industry consultants, banks, universities, colleges, research firms, city economic development employees, and others
- California Community Colleges Chancellor's Office (CCCCO) of Economic & Workforce Development (EWD)—IDRC & JDIF Grants

**Outcomes**

- 49 workshops offered--1,106 participants trained
- 289 employers participating
- Workshop topics: GMP, GLP, SOPs, Quality System Regulations-Medical Devices, Statistics for QA/QC, SAS, Aseptic Techniques, HPLC, other Instrumentation, Project Management, Bioinformatics, Cell Culture, Microbiology, Biotech for non-scientists, and others

## Ohlone College Biotech Programs:

### Training Displaced Workers

Biopharmaceutical-Biomanufacturing Certificate Program

**Partnerships & Funding Sources**

- Alameda County Workforce Investment Board (ACWIB)
- One-Stop Centers
- Biotech Industry: Genentech, Bayer, Amgen, and others
- Biotech Workforce Network
- Dept. of Labor Grant (administered by the Workforce Investment Board)
- State of California--Workforce Investment Act (WIA) Grant

**Outcomes**

- 151 students trained
- 86% placement rate with biotech jobs
- Average employment wage of $20.34/hr

## Ohlone Biotech Programs:

## Certificate & Degree Programs (LAB Program)

### 3 Certificates of Completion

- Biomanufacturing/Research Associate Certificate
- Computer Applcations in Biotechnology
- Biotech Summer Institute
- Learning Alliance for Bioscience (LAB) Program Certificate

### Future Certificates & Degree

- Certificate of Achievement in Cell Production & Fermentation
- Certificate of Achievement in Biotech Quality Control & Research
- Certificate of Achievement in Biostatistics
- Associate of Science Degree in Biotechnology

### Partnerships

- Biotech Education & Training Alliance (BETA Group)—composed of Biotech Industry, city & regional economic & workforce development agencies, and Ohlone College representatives

### Outcomes

- 325 students enrolled
- High School-College course articulation agreements

## Biotech Certificate & Degree Curriculum

### Core Courses (all certificates and degree):

- Intro to Cell & Molecular Biology
- Biochemistry for Health Science & Biotech
- Computer Applications for Biotechnology
- GMP & GLP
- Writing SOPs
- Careers in Biotechnology
- Intro to DNA Techniques
- PCR I & DNA Sequencing
- Protein Isolation & Assay
- Animal Cell Culture
- Bioreactor Cell Culture Technique
- Intro to Report & Technical Writing

❖ **Associate Degree** in Biotechnology—certificate of achievement + Gen Ed.

### Required for Certificate of Achievement

➢Cell Production & Fermentation Certif.
- Immunology
- Clean Room Operations

➢Biotech Quality Control/Research Certif.
- Genomic cDNA Library
- PCR Primer & Reverse Transcription PCR

➢Biostatistics Certif.
- Introduction to Bioinformatics
- SAS Programming
- Statistics & Probability

**Ohlone College Biotech Programs:**

**Learning Alliance for Bioscience (LAB) Program**
Career & Technical Education (CTE) Pathways (focusing on Underrepresented students)

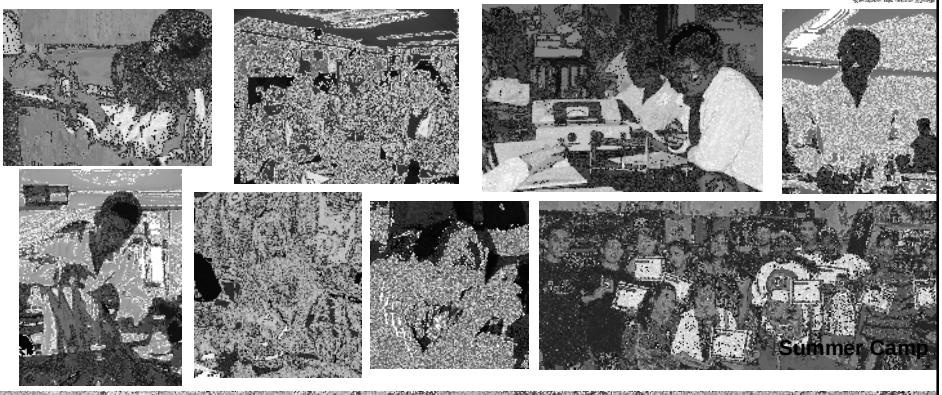
**Partnerships & Funding Sources**

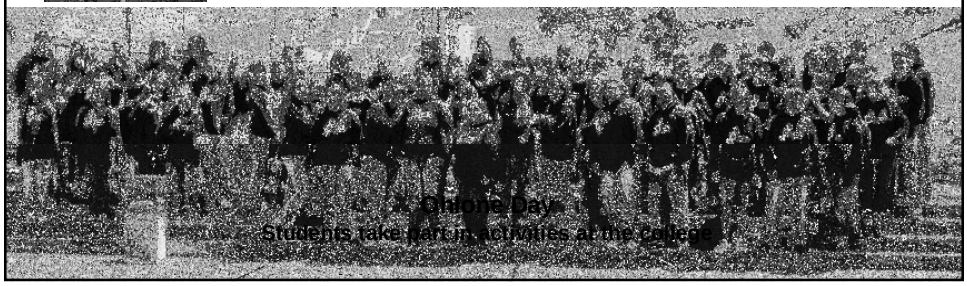
- School Partnerships including—Newark Memorial HS (Newark), Kennedy HS (Fremont), James Logan HS (Union City), Granada HS (Livermore), California School for the Deaf (Fremont), Chabot College (Hayward), Tennyson HS (Hayward), Newark Jr. HS (Newark) Cesar Chavez Middle School (Union City)
- National Science Foundation-Advanced Technical Education (NSF-ATE)
- SB 70 Grants—Quick Start, Strengthening CTE and 7th & 8th Grade Career Exploration

**Outcomes**

- 6 participating high schools (in 5 cities)
- 240 high school students (10th & 11th Grades)
- 2 Middle/Jr. High Schools (in 2 cities)
- 60 8th Grade students)

Students in the LAB Program



## Strong Partnerships

- **BETA (Biotechnology Education & Training Alliance)**
  - Amgen, Genentec, Genitope, Cell Genesys, Mendel Biotech, Inamed/Allergan, Johnson & Johnson (Scios), Metabolex
  - Economic Development Offices—Fremont, Newark, Union City & Hayward
  - Economic Development Alliance for Business (EDAB)
  - Alameda County Workforce Investment Board (WIB)
  - Ohlone College Biotech Department & Contract Education Office
- **Educational Partners**
  - CSU East Bay, San Jose State University
  - Chabot College, Skyline College, Contra Costa College
  - Newark Memorial HS, Kennedy HS, James Logan HS, Granada HS, California School for the Deaf, Tennyson HS, Mission Valley ROP
  - Newark Jr. HS and Cesar Chavez Middle School
- **Organizations & Agencies**
  - NASA/Ames
  - Bio-Link, California Applied Biotechnology Center—Bay Area (CalABC)
  - Lawrence Livermore National Lab (LLNL)
- **Funding Agencies**
  - National Science Foundation—ATE
  - California Community Colleges Chancellor's Office (CCCCO)-EWD

# Mission Valley ROP

## Biotechnology

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| 1 | Introduction | | * Introduction to Regulations and FDA requirements | | | |
| | | | * General overview of biotechnology definitions | | | |
| | | | * Overview of class description | | | |
| | | | * Discussion of various careers within Biotechnology | | | |
| 2 | Laboratory Notebooks | | * Setting up and maintaining a laboratory notebook | | | |
| | Laboratory Safety | | * Record keeping procedures | | | |
| | Biotechnology Careers | | * First aid supplies, PPE, and evacuation plans | | | |
| | Pipetting | | * Universal precautions | | | |
| | Centrifuge usage | | * MSDS | | | |
| | SOPs | | * Common laboratory hazards and demonstrate knowledge | | | |
| | | | * Types of Jobs/Careers | | | |
| | | | * Educational Requirements | | | |
| | | | * Familiarity with methods of pipetting: | | | |
| | | | | serological | | |
| | | | | volumetric | | |
| | | | | micro-pipetting | | |
| | | | * Understanding how to use a centrifuge | | | |
| | | | * Comprehend Technical Vocabulary | | | |
| | | | * Understand how to create an SOP | | | |

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| 3 Selecting Potential Products<br>Bioethics<br>Prepare reagents<br>Prepare buffers<br>Prepare media<br>Prepare solutions<br>pH meters<br>conductivity meters | * Product Development Plan<br>* Research and Development<br>* Manufacturing<br>* Testing/clinical trials<br>* Morals and ethics<br>* Values clarification model for decision-making<br>* Mathmatical calculations and conversions<br>* Creation of all types of components for solutions/process<br>* Understanding of pH meter usage<br>* Understanding of conductivity meter usage |
| 4 Organisms<br>Cellular Organization<br>Molecules of Cells | * Levels of biological organization<br>* Prokaryotic versus eukaryotic cells<br>* Model product manufacture<br>* Cell structure<br>* Survey of carbohydrates<br>* Survey of lipids<br>* Survey of Proteins<br>* Survey of Nucleic acids |
| 5 Sterility<br>Contamination<br>Introduction to DNA<br>Bacterial cell culture | * Knowledge of sterile techniques<br>* Prepare sterile media and buffer solutions<br>* Isolate cultures<br>* Structure and Function<br>* Base pairing<br>* Replication<br>* DNA technology |

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| 6 Protein Structure<br>Function of Proteins<br>Protein Production<br>Understanding of Proteins | * Importance of Antibodies and enzymes<br>* Protein synthesis<br>* Applications of Protein Analysis<br>* Introduction to Assays<br>* Usage of Assays<br>* Introduction to gels |
| 7 Advance Protein Studies<br>Spectrophotometer<br>Biotechnology in Plants | * ELISA<br>* Understanding how to use a spectrophotometer<br>* Using a spectrophotometer<br>* Sexual versus Asexual reproduction (cloning)<br>* Meiosis and sex cell formation<br>* Plant structure<br>* Plant cells, tissue and organs<br>* Seed germination<br>* Knowledge of plant based Pharmaceuticals<br>* Biotechnology in Agriculture and Horticulture |
| 8 Peptide synthesizers<br>Protein Engineering<br>Antibody Engineering | * Understanding and development of antibody function<br>* Simulate antibody-antigen testing<br>* Overview of enzyme activity<br>* Building a structure and function of proteins<br>* BLAST |

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| 9 Gel Electrophoresis<br>DNA | * In depth understanding of DNA<br>Sources of DNA<br>Isolating DNA<br>* Comparison from Prokaryotic, Eukaryotic, and viral DNA<br>* Introduction to viruses<br>* Use of gels to separate molecules<br>* Understanding of the different gel types<br>agarose<br>SDS-PAGE<br>Western Blot<br>* Collection of data from agarose gels |
| 10 SDS-PAGE<br>Introduction to Validation | * Prepare protein samples<br>* Load, run, and stain the gels<br>* Characterize the proteins from the PAGE gels<br>* Validation of the assay<br>* Understanding of validation of biotechnology<br>* Influence from Validation groups within biotech departments |
| 11 Protein Studies<br>Biotech processes<br>Development to Scale-Up<br>Production Assays<br>Quality Control | * Introduction to Proteomics<br>* Comparison of ELISA, Western blots, NMR, and Mass Spec<br>* Different kinds of fermentation<br>* Biotech process for growing cultures. The types<br>viral<br>bacterial<br>mammalian cells<br>plant cells<br>* Comprehension of scale-up transformations<br>* Development of production assays<br>* Introduction to Quality Control testing<br>* Overview of clinical testing |

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| 12 Quality Assurance<br>Marketing<br>Sales<br>Manufacturing | * Quality Assurance role within biotech organizations<br>* Factors that affect sales<br>* Proprietary rights<br>* Regulatory affairs influence and control in other countries<br>* Patent rights<br>* Development changes and regulatory modifications<br>* Introduction to column chromatography<br>* Understanding of protein recovery from cell culture |
| 13 Chromatography<br>Ion- Exchange purification<br>Anion-Exchange purification<br>Critical purification<br>Clarification | * Understanding the differences within chromatography<br>* Comparison of the types of purification resins<br>Ion-exchange<br>Anion-exchange<br>Affinity<br>* Utilizing critical chromatography steps such as Protein A<br>* Comprehension of clarification techniques<br>filters<br>CUNO<br>UF/DF skids<br>Misc. skids |
| 14 Column Packing<br>HETP<br>Assymetry<br>Pass-through<br>Concentration | * Attempting a column packing technique<br>* Working with dilutions on a packed column<br>* Trouble shooting packed columns and the pass through results<br>* Understanding of column flow results<br>* Performing of Assymetry and HETP<br>* Comprehension of concentration steps and techniques<br>small scale<br>large scale |

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| 15 Chromatography<br>Concentration | * Attemping chromatography techniques<br>* Utilizing previous assays to determine column type<br>* Utilize previous assays to determine antibody concentration<br>* Concentrate flow through/eluate material from purification |
| 16 Overview<br>Documentation Review<br>Bringing it back to biotech | * Reviewing all that was peformed in lab techniques<br>* Understanding how it is brought back to the biotech industry<br>* Personalizing medicine<br>* Biodefense incorporation<br>* Evolution to assist with bioterrorism |

## Partnerships

- Speakers
  - **Bayer Healthcare**
  - **Schering-Plough**
  - **Novartis**
  - **Invitrogen**
  - **Bristol Myers Squibb**
  - **AppTec**

Internship Possibilities

- Bayer Healthcare
- Boston Scientific
- Berlex
- Novartis